

Claims

1. A method for arranging a polymer molecule such as a biomolecule on a support, the method comprising the following steps:
 - 5 - providing a substrate (3) having a surface (2);
 - providing a surface layer (4) on said surface (2) of the substrate (3), said substrate (3) and said surface layer (4) providing a support (5); and
 - placing a polymer molecule (1) on said surface layer (4) in a first position, said polymer molecule (1) having a first conformation on said surface layer (4);
- 10 wherein said surface layer (4) is configured to adjust predefined molecular interaction between the polymer molecule (1) and said support (5) to allow fixing of the first conformation of the polymer molecule (1), and dislocating at least part of the polymer molecule (1) across said surface layer (4) relative to said support (5) by an external force.
- 15 2. The method according to claim 1, wherein the method comprises a step for subsequently fixing the polymer molecule (1) on the surface layer (4).
3. The method according to claim 1 or 2, wherein the method comprises a step for dislocating the polymer molecule (1) across said surface layer (4) by manipulation of said first
20 conformation of the polymer molecule (1) to a second conformation different from the first conformation of the polymer molecule (1), and fixing the polymer molecule (1) on the surface layer (4) in said second conformation by means of said molecular interaction between the polymer molecule (1) and said support (5).
- 25 4. The method according to one of the preceding claims, wherein the method comprises a step for dislocating the polymer molecule (1) across said surface layer (4) by changing said first position of the polymer molecule (1) to a second position different from the first position on the surface layer (4), and fixing the polymer molecule (1) on the surface layer (4) in said second position by means of said molecular interaction between the polymer
30 molecule (1) and said support (5).
5. The method according to one of the preceding claims, wherein in dependence on the polymer molecule (1) and the substrate (3) the surface layer (4) is configured to adjust

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force required for dislocating the polymer molecule (1) across the surface layer (4) is smaller than about 2nN.

- 5 6. The method according to one of the preceding claims, wherein the step of providing the surface layer (4) on said surface (2) of the substrate (3) comprises a step of forming domains and/or axes and/or further binding sites in said surface layer (4).
- 10 7. The method according to claim 6, wherein said external forces comprise attractive forces provided at least partly by said domains and/or axes and/or further binding sites in said surface layer (4).
8. The method according to one of the preceding claims, wherein the surface layer (4) is self assembling.
- 15 9. The method according to one of the preceding claims, wherein said step for providing the surface layer (4) on said surface of the substrate (5) comprises a step for using one or more of the following methods:
 - a chemical method with appearance of new chemical functionalities covalently bound to said surface (2) of the substrate (3);
 - 20 - plasma-chemical method;
 - thin or ultra-thin coating applied by surface adsorption method;
 - thin or ultra-thin spin-coating;
 - thin or ultra-thin coating applied by vacuum deposition method;
 - a Langmuir-Blodgett technique or a self-organized film technology;
 - 25 - Layer-by-Layer polyelectrolyte assembling; and
 - 2D-cristallization of low-, middle- or high molecular weight substances or their complexes on the surface.
- 30 10. The method according to one of the preceding claims, wherein the method further comprises a step for altering said molecular interaction between the polymer molecule (1) and said support (5).

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11. The method according to claim 10, wherein said step for altering said molecular interaction comprises a step for placing the surface layer (4) with the polymer molecule (1) provided thereon into a liquid medium.
- 5 12. The method according to claim 10 or 11, wherein said step for altering said molecular interaction comprises a step for drying the surface layer (4) with the polymer molecule (1) provided thereon.
- 10 13. The method according to one of the claims 10 to 12, wherein said step for altering said molecular interaction comprises a step for changing a temperature of the surface layer (4).
- 15 14. The method according to one of the claims 10 to 13, wherein said step for altering said molecular interaction comprises a step for applying an electric or/and magnetic field oriented perpendicular or at certain angle with respect to the surface of the support (5).
- 15 15. The method according to one of the claims 10 to 14, wherein said step for altering said molecular interaction comprises a step for exciting the polymer by light.
- 20 16. The method according to one of the preceding claims, wherein said external force is provided by using one of the following fields: electrical field, magnetic field, optical field and mechanical field, or any combination thereof.
- 25 17. The method according to one of the preceding claims, wherein a scanning probe microscope (SPM) is used for applying said external force.
- 30 18. The method according to one of the preceding claims, wherein the polymer molecule (1) comprises a polynucleotide such as DNA or RNA, a polypeptide such as protein, an antibody or antigen-antibody system, a polysaccharide, or a desired mixture of biomolecules
19. The method according to one of the preceding claims, wherein said surface layer (4) comprises an inorganic polymer, an organic polymer, an organic low molecular substance, a metal, a metal oxide, a sulfide, a semiconductor, or an optical element, or a any combination thereof.

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20. The method according to one of the preceding claims, wherein the substrate (5) is atomically flat.

5 21. The method according to one of the preceding claims, wherein the substrate (5) comprises glass, surface oxidized silicon, gold, molybdenum sulfide, highly oriented pyrolytic graphite (HOPG) or mica.

10 22. The method according to one of the preceding claims, wherein the method comprises a step for anchoring at least one end of the polymer molecule (1) to the support (5).

23. The method according to one of the preceding claims, wherein the method comprises a step for anchoring at least one end of the polymer molecule (1) to be arranged to a fiber, micro-particle or nano-particle.

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24. A product provided according to one of the claims 1 to 23, wherein a polymer molecule (1) such as a biomolecule is arranged on a surface layer (4) provided on a surface of a substrate (5) in a first conformation, said substrate (5) and said surface layer (4) providing a support (5), and said surface layer (4) being configured to adjust predefined molecular interaction between the polymer molecule (1) and said support (5) to allow fixing of the first conformation of the polymer molecule (1), dislocating at least part of the polymer molecule (1) across said surface layer (4) relative to said support (5), and subsequently fixing the polymer molecule (1) on the surface layer (4).

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25 25. Use of a method according to one of the claims 1 to 23 or a product according to claim 23 for recognition, detecting or analysis of a component of surrounding medium or/and of a polymer molecule (1) to be arranged.

30 26. Use of a method according to one of the claims 1 to 23 or a product according to claim 23 for recognition, detecting or analyzing of a molecule or chemical groups of a surface layer (4).

27. Use of a method according to one of the claims 1 to 23 or a product according to claim 24 for constructing a molecular device.

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